Research Project:

Market Potentials of Alternative Vehicles and Fuels up to 2050

A3plus - Technology Program

"Austrian Advanced Automotive Technology"

Sponsored by the Austrian Ministry of Transport, Innovation and Technology

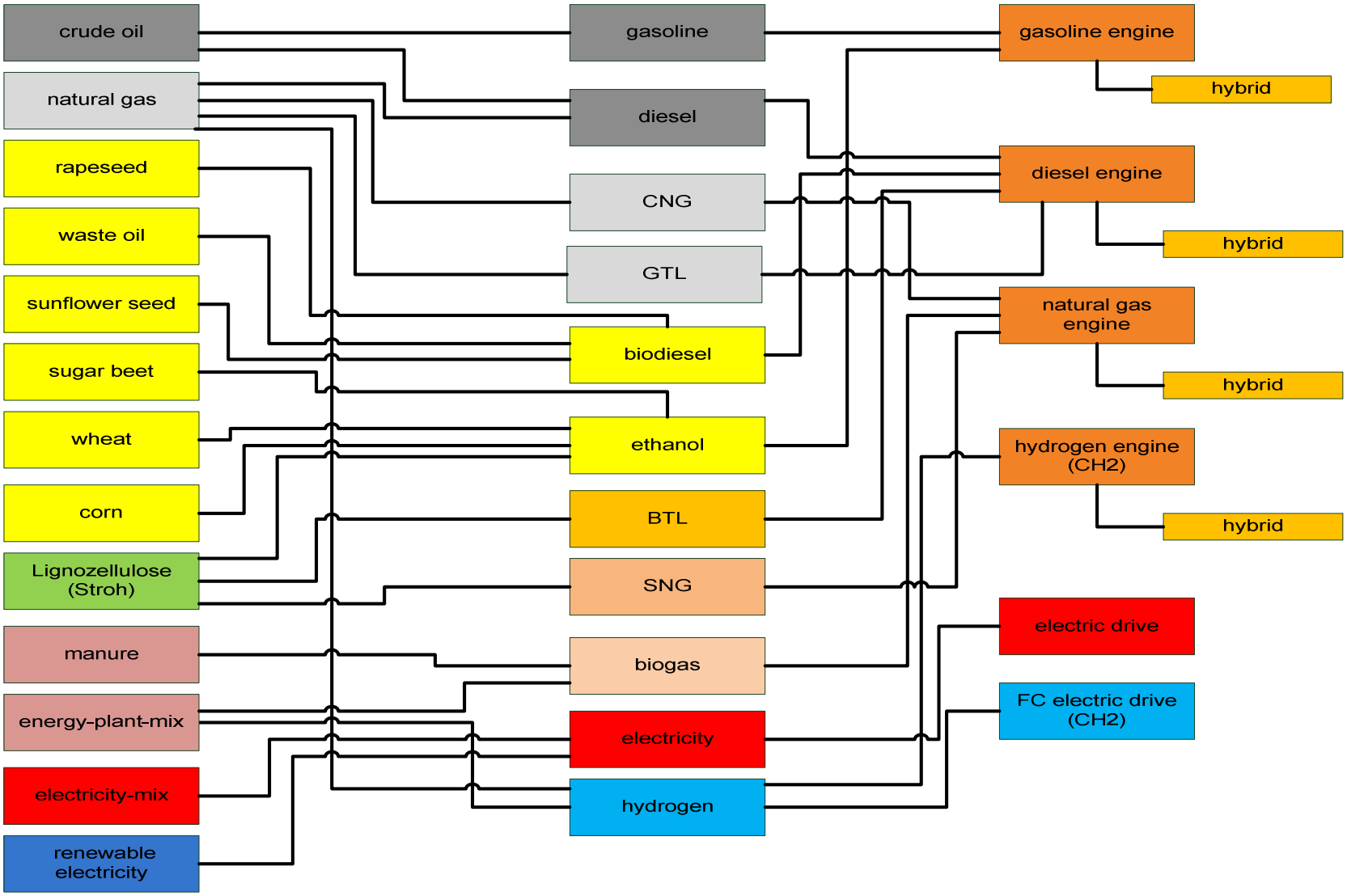
Partners: Joanneum Research Forschungsgesellschaft mbH

AVL List GmbH

Objectives:

- analysis of the economics of convenional and alternative vehicles and fuels
- estimation of market potentials
- development of scenarios for market shares under different framework conditions
- Analysis of the effects on the Austrian vehicle stock
- Analysis of the effects on energy consumption and greenhouse gas emissions of the sector

Pathways of Energy Transformation:



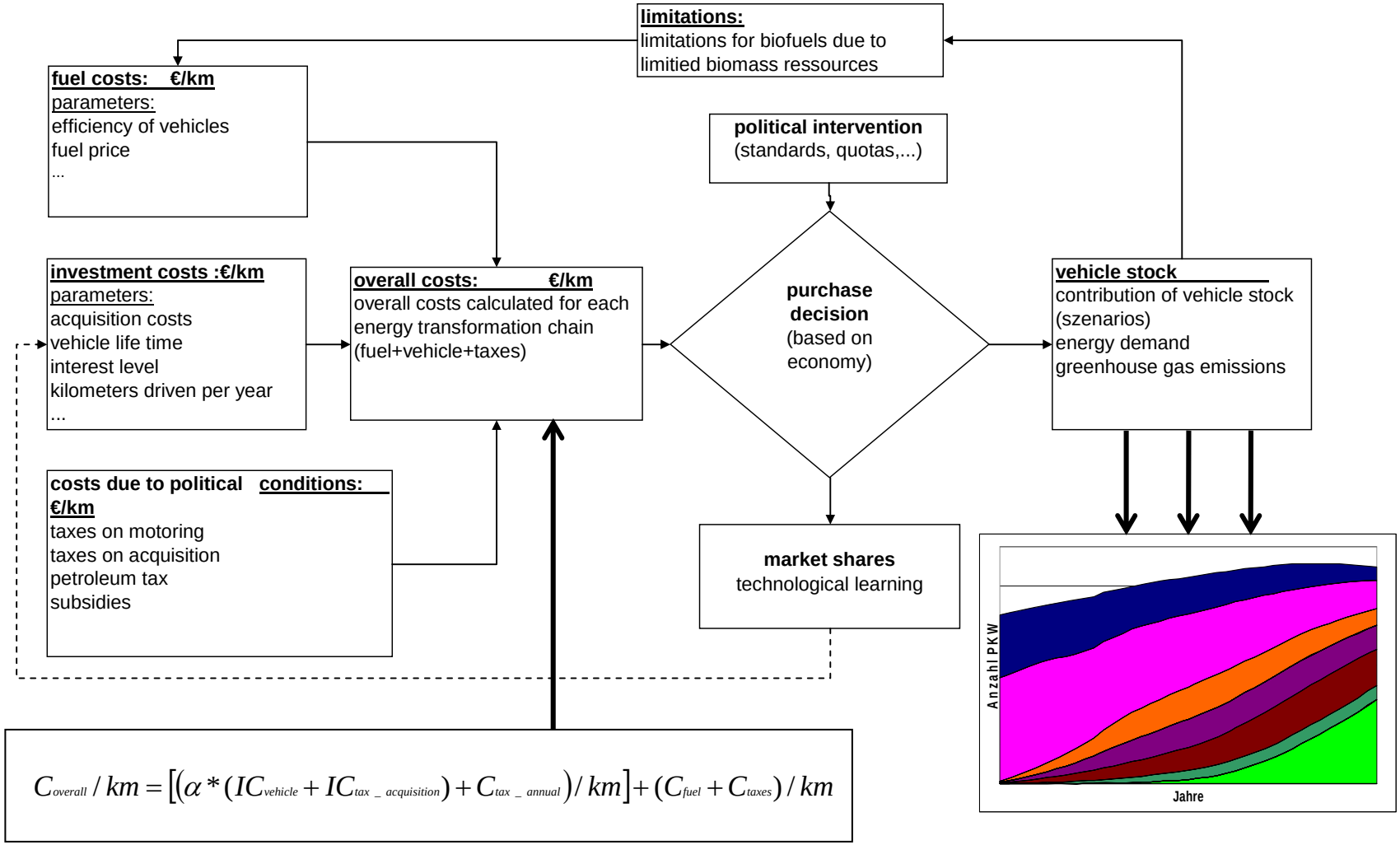
Economic Analysis and Modelling

- Energy Economical Approach
- Determination of a reference vehicle
- dynamic analysis of costs 2010-2050
  - Investment costs
  - fuel costs
  - taxes
- Comparison of costs per kilometre
- Distribution of anual vehicle sales (in terms of propulsion technology)
- Development of overall vehicle stock

Assumptions within the Analysis

- Customer decision is based mainly on economic criteria (costs/km)
- Reference Vehicle: same performance characteristics for all powertrain systems
- Technologies offer the same service level to the user (infrastructure, acceptance…)
- Technology Available (sufficient range of modells for each technology)

Methodology



4 Scenarios

- **Scenario A:** low crude oil price, policy BAU
- **Scenario B:** high crude oil price, policy BAU
- **Scenario C:** low crude oil price, policy „active“
- **Scenario D:** high crude oil price, policiy „active“

Szenario A & B

policy BAU:

	2010 - 2015	2016 - 2025	2026 - 2050
tax on ownership			
depending on engine power:			
tax on acquisition			
state 2008			
CO2=160 Bonus/Malus:			
fuel tax			
state 2007			
CNG+Biofuels:			

	Standard: €/l,€/kg	Standard: €/kWh	Alternative: €/kWh
Gasoline	0,447	0,051	0,06
Diesel	0,347	0,036	0,06
CNG	0,059	0,004	0,05
GTL	0,347	0,036	0,05
Bioethanol	0	0	0,05
Bioethanol (Ligno)	0	0	0,03
Biodiesel	0	0	0,05
Biomethane	0	0	0,03
BTL	0	0	0,03
SNG	0	0	0,03

Szenario C & D

policy „active“:

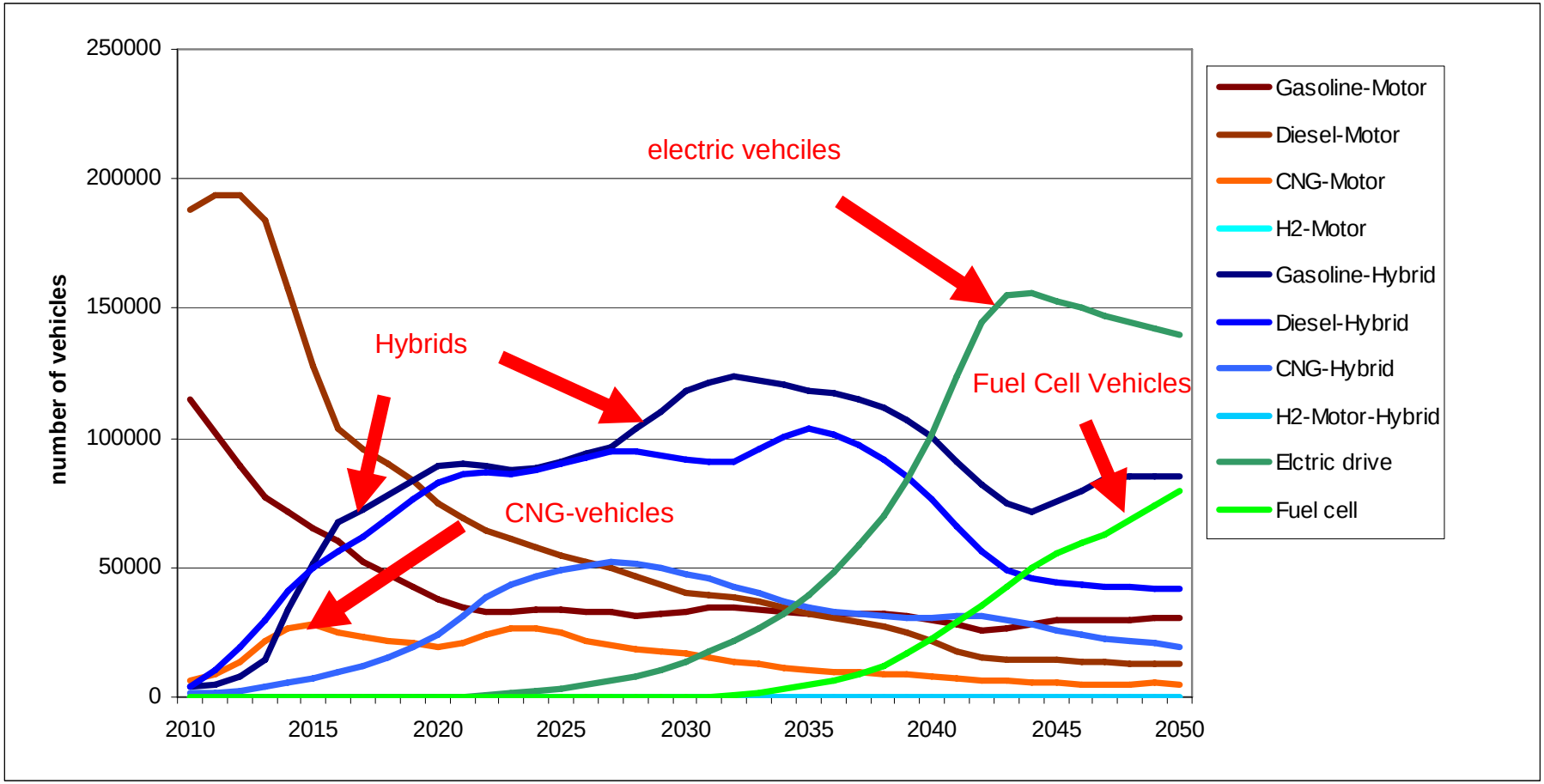
	2010 - 2015	2016 - 2025	2026 - 2035	2036 - 2050
tax on ownership				
depending on engine power:	■	■	■	■
tax on acquisition				
state 2008	■			
CO2=140 Bonus/Malus		■		
CO2=120 Bonus/Malus			■	■
quota:				
quota 1:		■		
quota 2:			■	■
fuel tax				
state 2007:	■			
alternative 1:		■		
alternative 2:			■	
alternative 3:				■

	Alternative 2: €/kWh	Alternative 3: €/kWh
gasoline	0,08	0,08
diesel	0,08	0,08
CNG	0,08	0,08
GTL	0,08	0,08
Bioethanol	0,06	0,08
Bioethanol (Ligno)	0,04	0,06
Biodiesel	0,06	0,08
Biomethane	0,04	0,06
BTL	0,04	0,06
SNG	0,04	0,06
H2 (natural gas)	0,02	0,08
H2 (renewabale)	0,02	0,06
electricity (mix)	0,04	0,08
electricity (renewable.)	0,04	0,06

Results:

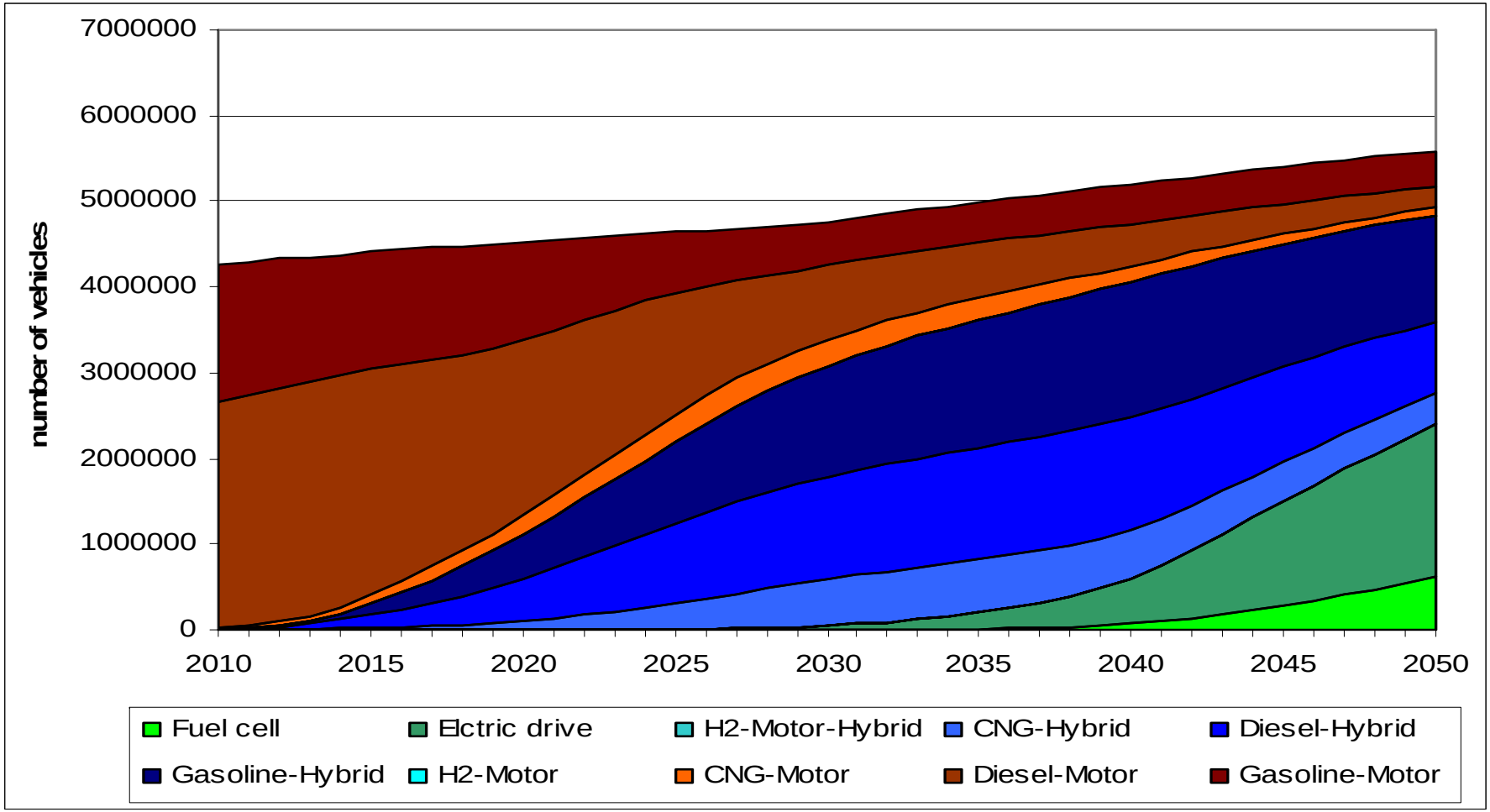
Scenario A

vehicle sales by propulsion technology:



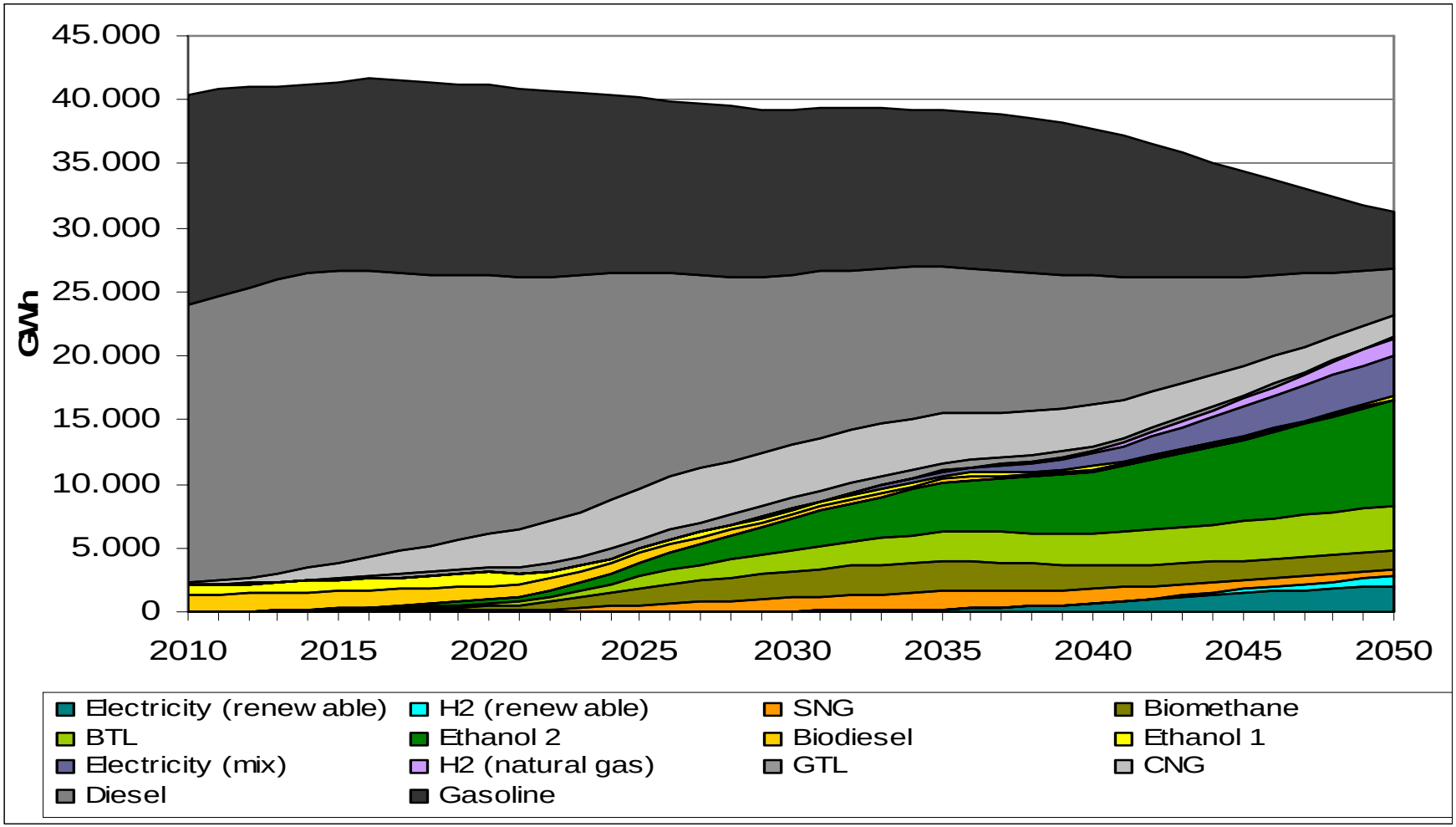
Scenario A

propulsion systems within the vehicle stock:



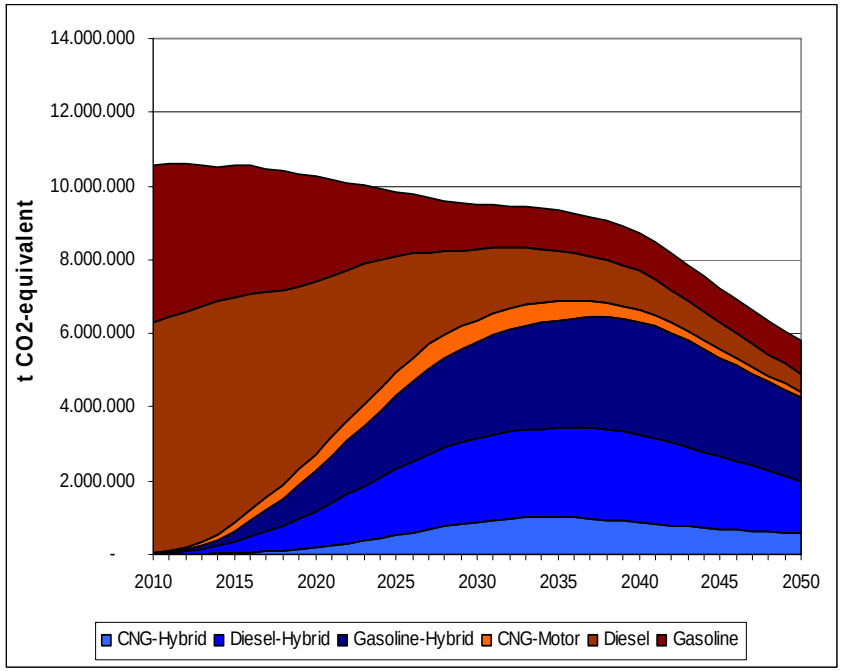
Scenario A

final energy consumption:

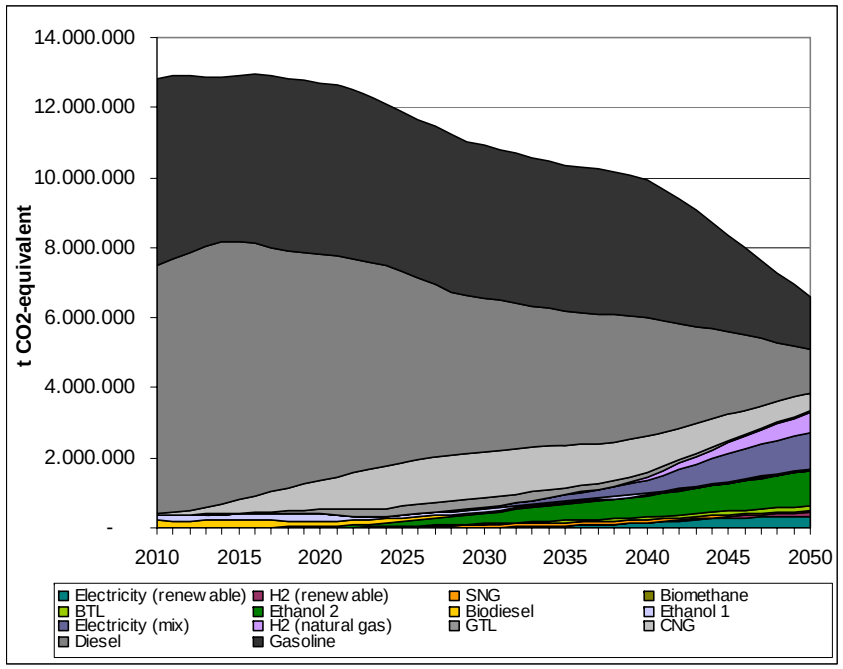


Scenario A

TTW – greenhouse gas – emissions:

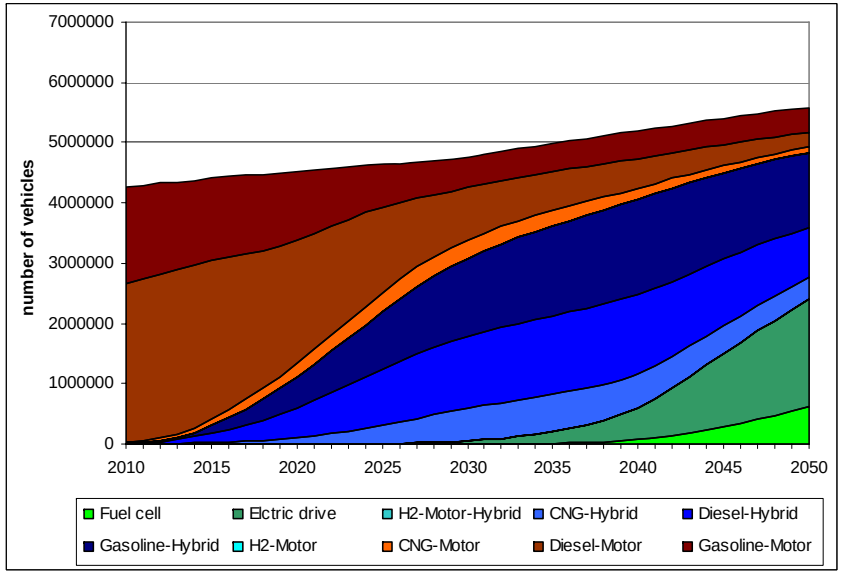


WTW – greenhouse gas – emissions:

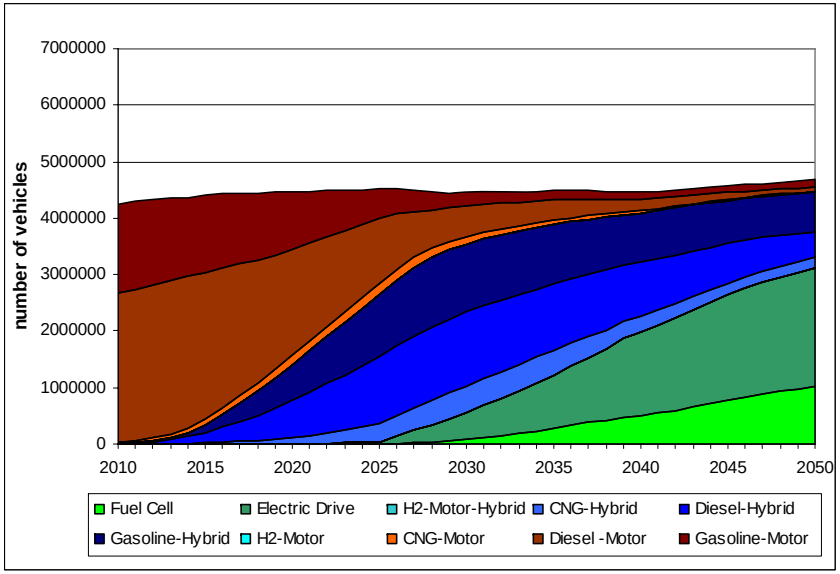


propulsion systems within the vhicle stock:

Scenario A:

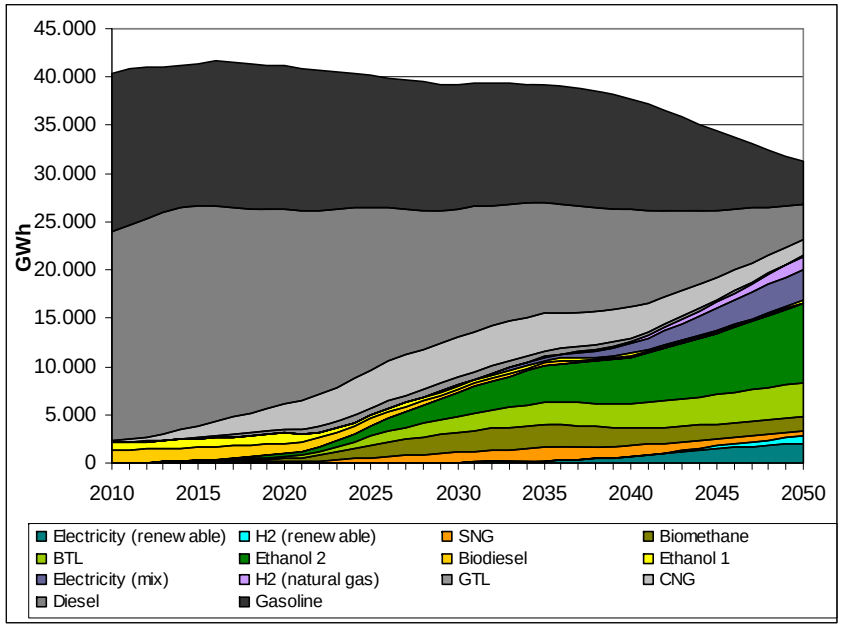


Scenario D:

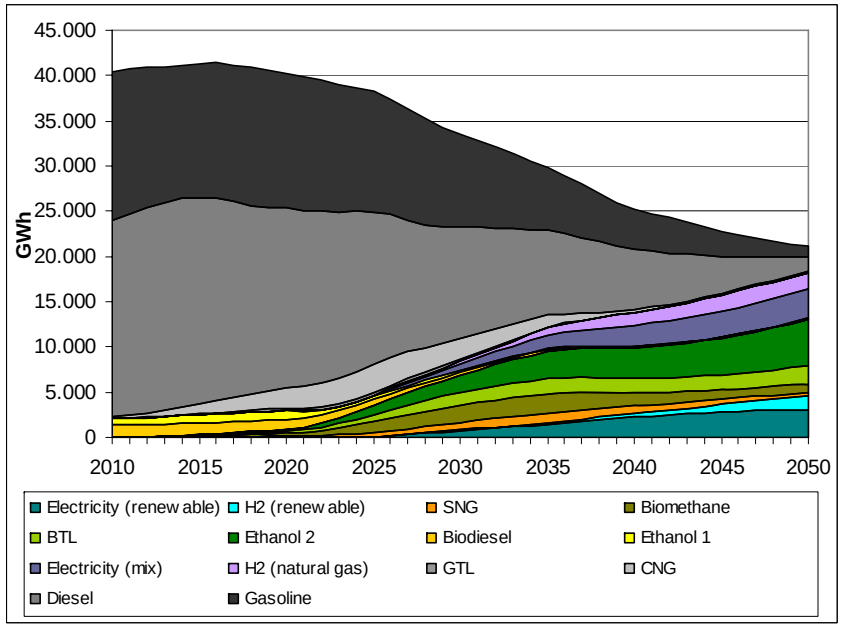


Final Energy Consumption:

Szenario A:

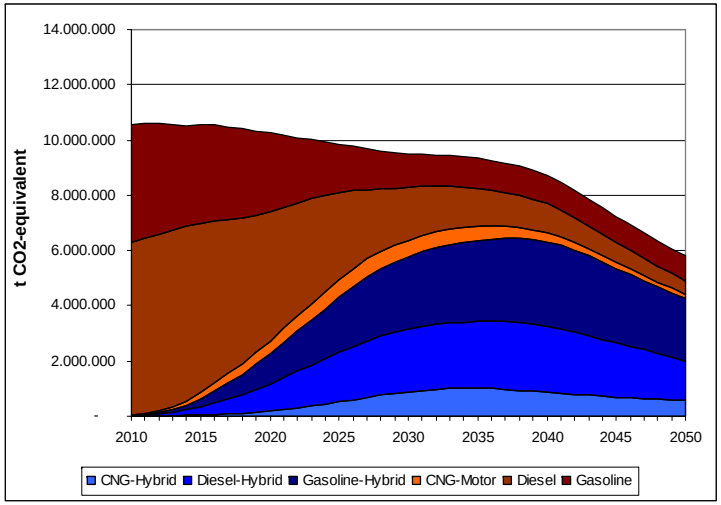


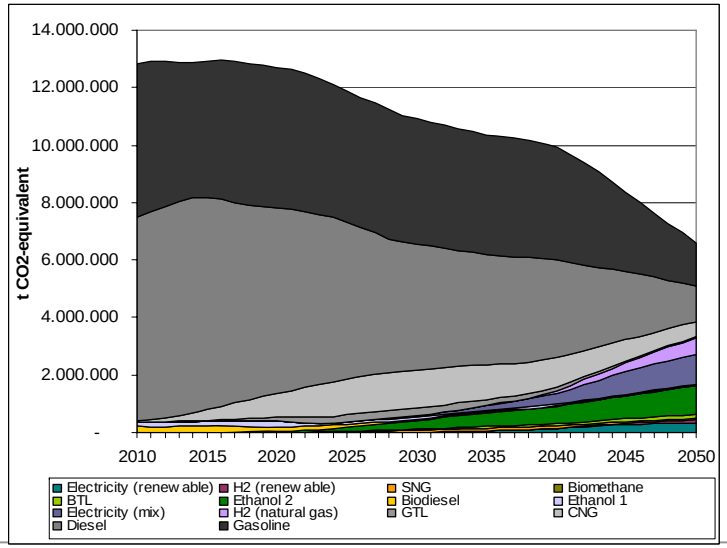
Szenario D:



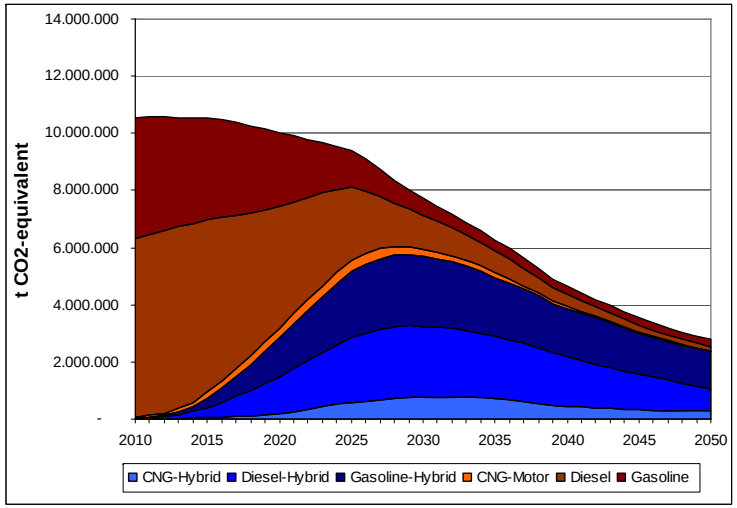
greenhouse gas – emissions -TTW and -WTW

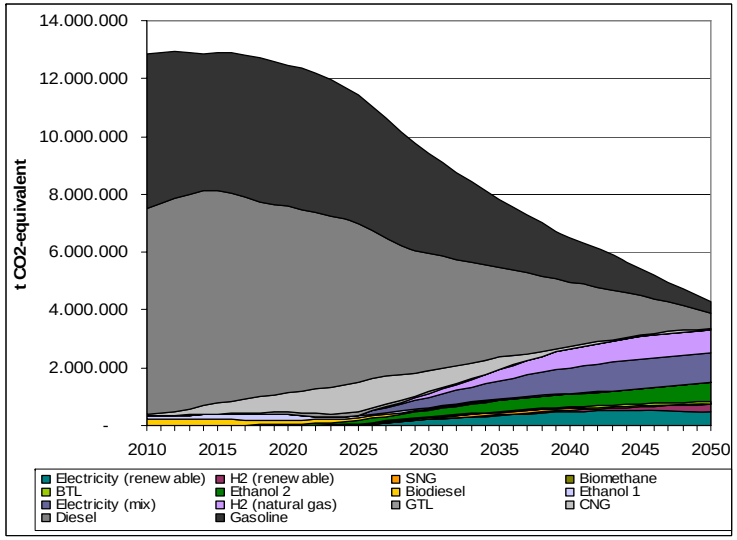
scenario A:





scenario D:





Conclusions:

- Even with present political framework conditions (BAU) a strong diffusion of alternative propulsion technologies can be observed
- Diffusion of alternative vehicles is very robust
- Decline in final energy consumtions and greenhouse gas emissions
- Strong diversification of energy carriers
- Strong influence of fuel price and policy measures on overall vehicle stock and energy consumption

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